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•THE• •VETERINARY• •JOURNAL•

A Monthly Review of Veterinary Science.

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Sub-Editor:
GLADSTONE MAYALL, M.R.C.V.S.

SEPTEMBER, 1924.

Editorial

TRUTH IN ADVERTISING.

SOME of the papers read at the recent International Advertising Convention held at the British Empire Exhibition contain phrases and paragraphs of especial interest to professional periodicals whose advertisement pages contain descriptions of the marvellous properties of drugs and remedies suggested for use in the fight against disease.

Some are advertised as "cure alls," and the fact that they are accepted by a professional press gives a backing to their claims which they could not get in any other way.

Trade journals have for some time recognised the deceit practised upon the general public by untrue flaunting advertisements, and have of recent years taken this matter especially in hand.

In a paragraph from a paper by Mr. C. F. Tomkinson, the advertising manager of a well-known London Store, on "Results from Newspaper Advertising in Great Britain," the author said:—

> "To-day, when a woman buys from an advertisement in any reputable English newspaper or magazine, she can do so with the assurance that if the goods supplied are not what their description led her to believe, the newspaper in which the advertisement appeared will itself take the matter up."

It is only too obvious that where life and death are the stakes at issue, even more care should be exercised to avoid any semblance of lending aid to the raising of false hopes by foisting on the purchaser something to which is attributed high sounding properties which do not exist.

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" Cure alls " and obvious quack remedies ought not to receive official countenance, and it is a good thing for the patient, whether human or veterinary, that the professional man stands in between as the skilled brain to make the diagnosis and prescribe or reject the so-called " remedy."

The risk is run when the owner, thinking that the " remedy " must be valuable because its advertisement is accepted by the professional press, buys and administers it. In such cases it is not only his pocket which suffers (to the pecuniary benefit of the coffers of the quack vendor), but the poor patient is made to " go through it " absolutely uselessly.

America is well ahead of us in this respect, as the advertised properties (therapeutic and otherwise) of " cure alls " and " quack remedies " are submitted to a Government official test, and the result is published officially in a printed form, which any citizen can obtain for a few pence. A perusal of their list reveals the swindling inadequacy of quite a number of the so-called " cures " advertised unrestrictedly in this country. Any veterinary practitioner who cares to have this " Black List " of false pretentions can do so free of charge by merely writing (stating his qualifications) to the Government Bureau at Washington, U.S.A. Its perusal will give him an interesting Sunday afternoon, for it is an instance of the thoroughness with which our American *confrères* are endeavouring to follow up the motto of " Truth in advertising " from the veterinary aspect as well as in many other ways.

OFFICIAL VETERINARY CONTROL IN THE FREE STATE OF IRELAND.

As might be expected, the organisation of the Ministry of Agriculture in the Free State has suffered very much during the last few years owing to the recent disturbed state of the country, and some time ago the Veterinary Medical Association of Ireland (which may be said to officially represent the profession in the Free State) put forward certain suggestions for the formation of an efficient Veterinary Department under the Contagious Diseases of Animals Acts. Owing to lack of funds the scheme was not adopted, and the Minister has suggested a temporary measure whereby one whole-time Inspector would be appointed for each county at a salary similar to that paid at present to the ordinary Inspectors of the D.A.T.I.

At a recent meeting held in Dublin on the 17th of July of the Veterinary Medical Association of Ireland, the members again urged upon the Government the pressing necessity for establishing as soon

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as possible an efficient veterinary service. The points particularly emphasised were the pecuniary loss to the country, from the want of an efficient control, of contagious diseases of animals; secondly, the great danger of the transmission of bovine tuberculosis to human beings; and thirdly, the impossibility of one whole-time county veterinary officer being able to efficiently carry out the duties of his position under the Contagious Diseases of Animals Acts. In connection with the latter, too, emphasis was laid upon the inadequacy of the salary which was proposed to be granted; and it was stated that it would not induce men of experience and ability to seek the appointment.

We cordially support the effort of our *confrères* in the Free State to obtain a proper recognition of the value of their services, and if we judge the Irish character aright, we imagine that they will not rest contented until they have gained their object. A Government Department should set an example in these things, and it is a pity that we do not act more up to the spirit of the motto of our profession by refusing to accept these ill-paid Government appointments, which, we are repeatedly told, are made the standard upon which the remuneration of other appointments of a similar nature is based. *Government jobs ought to be the plums of our profession and to be of such a character that they induce our best men to apply for them. The proverb that "the labourer is worthy of his hire" is as aptly applied to positions in our profession as to positions in any of the other learned professions.*

It will be interesting now to watch whether our Free State *confrères* succeed any better in obtaining adequate remuneration for these Government posts than is given to siuiilar positions in Great Britain.

General Articles

FELINE TUBERCULOSIS IN RELATION TO MAN.

By A. STANLEY GRIFFITH, M.D.,

Research Bacteriologist to the Medical Research Council.

(*From the Pathological Department of the Field Laboratories, University of Cambridge.*)

Tuberculosis in the cat is not uncommon in this country, and when cases of human and feline tuberculosis occur together in the same household the question naturally arises whether tuberculosis is transmissible from cat to man or *vice versa.*

Experimentally it has been shown—by the Royal Commission on

Tuberculosis (1)—that the cat is very susceptible to the bovine type of tubercle bacillus and highly resistant to the human type. Whether inoculated into the peritoneal cavity or the subcutaneous tissues the bovine tubercle bacillus produced general, and usually severe, progressive tuberculosis in cats; whereas large doses of human tubercle bacilli similarly inoculated gave rise to a limited retrogressive tuberculosis, which was for the most part confined to the seat of inoculation and adjoining glands. When introduced into the body by way of the alimentary tract the bovine tubercle bacillus produced tuberculosis, which in adult cats was often limited to the mesenteric or the pharyngeal glands and showed retrogressive features, while in kittens it was usually generalised and progressive. Human tubercle bacilli, on the other hand, introduced by feeding in very large doses, failed to produce any sign of tuberculosis either in cats or in kittens.

In view of the high degree of resistance manifested by cats to the human tubercle bacillus experimentally introduced, it is not to be anticipated that this type of bacillus plays any part in the causation of naturally acquired tuberculosis in cats, and the few observations that have so far been published confirm this expectation.

The cases of feline tuberculosis that have been investigated bacteriologically in this country and reported on are four in number, and from each case (fully virulent) tubercle bacilli of bovine type were obtained. The following is a list of these cases:—

(1) A case of alimentary tuberculosis examined by the Royal Commission on Tuberculosis.(2)

(2) and (3) Cases examined by Cobbett and referred to in his book.(3)

In these three cases only a small portion of tissue was sent for examination, and nothing was stated with regard to the general distribution of the disease.

(4) A case of severe general tuberculosis of alimentary origin investigated by me.(4)

This case was a great danger to the human beings who came in close contact with it. During the last months of life the cat suffered from frequent cough, and after death was found to have chronic pulmonary tuberculosis with cavities. The caseo-pus in the cavities was swarming with tubercle bacilli, and these organisms were also found in muco-purulent material in the larynx.

Five more cases which I have had the opportunity of examining recently can now be added to the list. A further case, diagnosed as

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tuberculous, is included in the protocols, but from this no cultures were obtained.

For supplying me with the original material of these cases I am greatly indebted to Mr. Humphrey Neame, F.R.C.S., London, Captain Dunlop Martin, M.R.C.V.S., and Captain Frederick Donne, M.R.C.V.S., Southend-on-Sea.

A description of the anatomical distribution of the tuberculosis and the results of the bacteriological investigation in each case is presented below.

CASE 1.—Received March 7, 1923, from Mr. Humphrey Neame. The cat was aged eleven months, and was killed because of blindness; it was the only survivor of a litter. The animal had never been lively, and for the last ten days was lethargic and took very little food. The kitten had been fed on boiled milk from the table at breakfast and on unboiled milk at other times. From the same litter, six months previously, another kitten was killed because of defect of sight. The eyes were examined by Mr. J. B. Lawford and Mr. Humphrey Neame, who found choroidal tuberculosis and retinal detachment. No autopsy was made on this kitten. There was no history of illness among the inhabitants of the houses in which these kittens were born or had lived. The mother of the kittens was said to be alive and healthy.

Autopsy.—Small intestine showed a nodule in the wall, not in the mucosa. In the large intestine the solitary follicles appeared enlarged, but there was no evidence of tuberculosis. Mesenteric glands much enlarged and extensively caseous (very numerous T.B.). Spleen showed enlarged malphigian bodies and a few caseous tubercles. Liver and kidneys normal. Lungs, miliary tubercles throughout. Bronchial glands contained several small whitish nodules (numerous T.B.). Eyes: complete retinal detachment and a mass in the choroid of each. T.B. were found microscopically. The histological characters of the eyes of the two kittens are described by Mr. J. B. Lawford and Mr. H. Neame in the *British Journal of Ophthalmology*, July 1923. Their comment on the two kittens is as follows: "The occurrence of blindness in cats is by no means common, and as the result of binocular tuberculosis distinctly rare. Its presence in both eyes of two kittens of the same litter is probably unique."

Bacteriological Investigation.—Two guinea-pigs inoculated intraperitoneally with emulsion of mesenteric glands died of general tuberculosis (G.T.) in 63 and 70 days. Cultures of T.B. obtained directly from the mesenteric and bronchial glands and the spleen were dysgonic (Class I), i.e. they produced scanty growths on glycerin media and were identical with bovine strains, which grow

with the most difficulty. Two rabbits, each inoculated subcutaneously with 10·0 mg. of the mesenteric gland culture, died of typical " bovine " G.T. in 50 and 74 days.

CASE 2.—Adult cat. Received March 7, 1923, from Captain Frederick Donne, M.R.C.V.S.

Autopsy.—Mesenteric glands, slightly enlarged, contained small caseous areas, 1 to 2 mm. in diameter (scattered short T.B.). Lungs were much enlarged, heavy and composed almost throughout of translucent grey substance infiltrated with irregular opaque whitish foci. The anterior lobes were entirely replaced by this substance, but the posterior lobes contained crepitant lung tissue, mainly in the centre and ventrally, in which the tuberculous areas were small and in places discrete. The tuberculous tissue was friable and readily emulsified (scattered T.B.). Bronchial glands contained small caseous areas. Sections (for which I thank Mr. E. G. D. Murray) showed the lungs in a condition of tuberculous pneumonia. No crepitant lung tissue was seen. The alveoli where these were still distinguishable were filled with desquamated epithelium cells. The bronchi and bronchioles were filled with cells—desquamated and proliferating epithelium cells, leucocytes and a few red corpuscles. The cells in the consolidated parts of the lung were largely epithelioid cells, having in places an alveolar arrangement; there were also collections of lymphocytes, diffuse areas of necrosis (in one of which T.B. were found) and a scanty reticulum of fibrous tissue. There were no giant cells.

Bacteriological Investigation.—Three guinea-pigs inoculated intraperitoneally, one with lung and two with mesenteric glands, died of G.T. in from 28 to 52 days. Cultures of T.B. obtained directly from the lung and mesenteric glands were dysgonic (Class II).

One rabbit inoculated subcutaneously with culture from the lung and one with culture from the mesenteric gland, dose in each case 10·0 mg., died in 50 and 64 days of typical " bovine " G.T.

CASE 3.—Viscera of a male cat, aged twelve years, received from Captain Dunlop Martin.

Autopsy.—No ulcers in small intestines. The mesenteric glands were greatly enlarged; in the anterior part of the mesentery there was a mass the size of a hen's egg; there was a smaller mass in the posterior mesentery; on section these masses were found to be composed of dense pearly white, almost cicatricial tissue, homogeneous, and without sign of caseation or calcification. Close to the anterior mass in the hilus of the liver there was a small mass similar to those in the mesentery. An ileo-cœcal gland was enlarged and congested. The omentum was closely beset with fibrous miliary tubercles. Lungs: in the right anterior lobe there was a firm nodule about

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1 cm. in diameter composed throughout of dense translucent fibroid tissue. A bronchial gland corresponding to this nodule was enlarged and fibroid. Liver and spleen normal.

Bacteriological Investigation.—The lung nodule was emulsified and inoculated into a guinea-pig, which remained healthy. It was impossible to emulsify the masses in the mesentery or the omental tubercles. No T.B. were found in the emulsion of the lung nodule or in a scraping from the cut surface of a mesenteric tumour. Cultures from the lung nodule remained sterile.

Comment.—This case is worthy of record, though no cultures were obtained. Captain Dunlop Martin considered it from superficial inspection to be a case of G.T. with acute miliary tuberculosis of the omentum. This opinion I shared until I came to cut into the lesions. All the lesions were composed of dense fibrous tissue and there was no sign of caseation or calcification. The anatomical distribution of the lesions was, however, entirely typical of alimentary tuberculosis in the cat, and I therefore regard the case as one of healed tuberculosis.

CASE 4.—Adult cat. Received March 31, 1923, from Captain Dunlop Martin.

Autopsy.—Small intestines normal. Colon showed enlarged solitary follicles, some of which were ulcerated (contents of colon black, the result of hæmorrhage; the death of the cat was due apparently to ulcerative colitis). Mesenteric glands; two the size of large peas were caseo-calcareous. Spleen contained half a dozen caseo-calcareous tubercles. Lung: left lung intimately adherent to chest wall; both lungs contained scattered caseo-calcareous tubercles. Other organs and glands normal.

Bacteriological Investigation.—Two guinea-pigs inoculated intraperitoneally died of severe G.T. in 33 and 44 days. Cultures from the mesenteric glands were dysgonic (Class I). Two rabbits inoculated subcutaneously each with 10·0 mg. of culture died in 33 and 77 days of typical "bovine" G.T.

CASE 5.—A female cat aged three years, received on June 6, 1923, from Captain Dunlop Martin. The master of the house from which the cat came was suffering from chronic pulmonary tuberculosis.

Autopsy.—Retro-pharyngeal glands enlarged, each contained three or four small caseous nodules; pharynx and tonsils normal. Lungs, crepitant; in the left caudal lobe there was a caseous nodule rather more than 1 cm. in diameter; all the lobes contained miliary tubercles in moderate number. Bronchial glands: the intertracheo-bronchial glands were enlarged and caseous practically

throughout ; prae-tracheo bronchials normal. There was no sign of tuberculosis in the abdomen.

Microscopical.—T.B. were extremely numerous in the lung nodule and in the caseous bronchial glands, and moderately numerous in the pharyngeal glands.

Bacteriological Investigation.—Four guinea-pigs inoculated intraperitoneally, two with bronchial gland and two with pharyngeal gland, died of acute tuberculosis in from 13 to 23 days. Cultures obtained directly from the pharyngeal and bronchial glands were dysgonic (Class II). Two guinea-pigs inoculated subcutaneously each with 0·1 mg. of the bronchial gland strain died of G.T. in 52 and 56 days. Three rabbits were inoculated subcutaneously with the pharyngeal strain and three with the bronchial gland strain, the dose in each case being 10·0 mg. All died of G.T., which was typically " bovine " and of maximum severity except in one of the former.

Comment.—The anatomical distribution of the lesions in this case indicated that the tuberculosis was of respiratory origin.

CASE 6.—Body of female cat, received on September 22, 1923, from Captain Dunlop Martin, who sent with it the following notes : " The cat was in great respiratory distress when brought to be chloroformed. The left pleural cavity was found full of fluid—5 to 6 ounces —and contained large masses of coagulated lymph ; mediastinum much thickened. The cat came from a home where the head of the family was an old case of tuberculosis, said to be cured."

Autopsy.—Intestines apparently normal. One mesenteric gland, slightly enlarged, was caseo-calcareous nearly throughout. Spleen, liver and kidneys normal. Thorax : ventral mediastinal pleura thickened, parietal pleura congested and covered with shaggy congested connective tissue. Left lung much contracted, fibrotic and honey-combed with irregular cavities containing pus or yellow necrotic masses ; there was no crepitant lung tissue. The right lung was larger but was also much altered ; there was very little crepitant lung tissue, the greater part being hepatised (sinking in water) ; here and there were some pale greyish white solid areas which exuded purulent fluid on pressure and one contained pus. Bronchial glands, a little enlarged, were not caseous.

Microscopical.—Numerous short T.B. in mesenteric gland and necrotic substance from lung.

Bacteriological Investigation.—Four guinea-pigs were inoculated intraperitoneally ; two with lung pus died in 10 and 13 days of acute tuberculosis, two with mesenteric gland died of severe G.T. in 43 and 55 days. Direct cultures from lung and mesenteric gland were dysgonic (Class I). Two rabbits inoculated subcutaneously, each with

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10·0 mg. of the lung strain, died of typical " bovine " G.T. in 46 and 49 days.

The results of the investigation of the six cats may now be summarised :—

In one of the cats the anatomical distribution of the disease was typical of tuberculosis, but tubercle bacilli were not demonstrated in the lesions; this case is regarded as one of healed tuberculosis in the cat.

From the other five cases cultures of tubercle bacilli were obtained. The cultures were dysgonic and identical in cultural characters with tubercle bacilli of bovine tuberculosis. Emulsions of the tuberculous lesions of the cats produced typical rapidly fatal tuberculosis in guinea-pigs and the cultures gave rise in rabbits inoculated subcutaneously to fatal progressive general tuberculosis identical with that set up by tubercle bacilli of bovine origin. In four of the five cats the infection was definitely alimentary in origin, and was without doubt caused by consuming unboiled cow's milk or tuberculous offal. In one cat (Case 5) the infection appeared to be of respiratory origin, i.e. primary in the lungs.

The master of the house from which the last mentioned cat came suffered from pulmonary tuberculosis. The result of the investigation of the culture from the cat was therefore awaited with interest. As the infection in the cat was " bovine " there was probably no connection between the cases (and this statement applies also to Case 6), but this has not been definitely excluded since it has been impossible to obtain a specimen of sputum from the man.

Obviously cats can be infected by human beings who are expectorating bovine tubercle bacilli, but human pulmonary tuberculosis produced by bovine tubercle bacilli is so rare that transmission of bovine tuberculosis from man to cat cannot be affirmed without bacteriological evidence that the human being was disseminating " bovine " bacilli.

While it is unlikely that tuberculosis, either of human or of bovine type, is ever transmitted from man to cats, the danger of transmission of tuberculosis from cat to man is unquestionable. The cat is, as the above investigations prove, naturally susceptible to infection with bovine tubercle bacilli, and infected cats frequently die of ulcerative pulmonary tuberculosis, the pus in the cavities containing numerous tubercle bacilli. Since human beings are susceptible to bovine tubercle bacilli, the tuberculous cat is a dangerous pet in a household, especially where there are children.

The number of cases of casual tuberculosis in cats which have been investigated bacteriologically is still very small, and I am pre-

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pared to examine a larger series if members of the veterinary profession will co-operate with me and provide me with material.*

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(1) Royal Commission on Tuberculosis. Appendix to Second Interim Report, vol. i. p. 407, vol. ii. p. 1184; Appendix to Final Report, vol. i. pp. 46 and 49.
(2) F. GRIFFITH: Appendix to Final Report of Royal Commission on Tuberculosis, 1911, vol. iv. p. 151.
(3) L. COBBETT: "The Causes of Tuberculosis," *Cambridge University Press*, 1917, p. 511.
(4) A. STANLEY GRIFFITH: "An Investigation of Strains of Tubercle Bacilli from Animal Tuberculosis," *Journal of Pathology and Bacteriology*, vol. xxii., 1917.

IMMUNISATION OF ANIMALS AGAINST INFECTION BY *VIBRION SEPTIQUE* AND *BACILLUS CHAUVŒI.*

BY H. R. ALLEN, M.R.C.V.S.,
Wellcome Physiological Research Laboratories, Beckenham, Kent,
AND
T. J. BOSWORTH, B.Sc, M.R.C.V.S., D.V.S.M.,
Institute of Animal Pathology, University of Cambridge.†

IT has long been recognised that the domesticated animals, especially cattle and sheep, are subject to acute, and usually fatal, infection by both *Vibrion septique* and *Bacillus chauvœi.* Cases of disease in horses and swine have also been ascribed, though with less frequency, to one or other of these organisms. Before passing on to deal with these particular infections in animals a few observations on anaerobes in general are perhaps necessary.

Prior to the war there appears to have existed a great deal of confusion regarding the real differences between the various groups of anaerobes. A few workers undoubtedly were aware of these differences, but they were vastly outnumbered by those who were not. Pure cultures were thus extremely rare, and most of the descriptions then given are consequently of little value at the present time. As a result, however, of the large amount of work carried out during the war period and of the improved technique evolved, the subject is now in a much more satisfactory state. Particularly is this the case in so far as *V. septique* is concerned. The use of the term "malignant œdema bacillus" applied to a proteolytic culture is now less frequently seen in the literature than formerly. But as an indication that the differences between groups of anaerobes are not universally appreciated even now, we may mention that during the

* I shall also be glad of fresh tuberculous material from other domestic pets (dogs, parrots, etc.) and from horses. Professor J. B. Buxton, M.A., F.R.C.V.S., Professor of Animal Pathology, University of Cambridge, permits me to add that he endorses this appeal.

† This work was carried out at the Wellcome Physiological Research Laboratories.

course of this work we have received from various laboratories four cultures of supposed *B. chauvœi* all of which contained *V. septique*, in three cases in pure culture, in one contaminated with *B. sporogenes*. For a clear description of the main characters of *V. septique* and *B. chauvœi* we would refer to the article published in 1920 by Heller (1), which contains an excellent critical review of the literature dealing with the anaerobic infections of animals together with the results of her own examinations of many strains of anaerobes obtained from animal material.

We have studied fifteen strains that were isolated from cases diagnosed clinically as blackleg, and found that ten were *B. chauvœi* and five *V. septique*. Of the *B. chauvœi* strains, five were obtained from various laboratories and five were isolated by us from fresh muscle. Of the strains which proved to be *V. septique*, four were sent to us as *B. chauvœi* and one was isolated from fresh muscle. The six specimens of fresh muscle were sent to us by veterinary surgeons from cases which they had diagnosed as clinical blackleg. *B. chauvœi* was isolated from five of these. In the remaining case we searched very thoroughly for this organism, but without success, though we tried all the methods at our disposal to obtain it in culture. On the other hand, we had no difficulty in isolating *V. septique*. The muscle had all the appearances of blackleg muscle and possessed the sour but not putrefactive odour which we have been taught to regard as typical of such cases. In the specimens from which we isolated *B. chauvœi* no *V. septique* was present.

Our strains agree very closely in all their essential characters with the descriptions given by Heller (*loc. cit.*), and as these are now so well known it is quite unnecessary for us to enter into all the details. We should like to repeat, however, that both organisms are non-proteolytic, neither digesting nor blackening meat or brain media, and they do not exhale a putrid odour. In pure culture they may readily be distinguished the one from the other by a consideration of their colony formation, sugar fermentations, lesions produced in experimental animals, and by the property possessed by *V. septique*, in contrast to *B. chauvœi*, of forming filaments on the surface of the liver in such animals.

We were particularly interested in the fact that a proportion of our strains proved to be *V. septique*, as until comparatively recently it was generally believed that blackleg was a specific disease attributable solely to infection by *B. chauvœi*. It may be too early yet to assert that such is not the case, but it must be admitted that evidence to the contrary increases year by year.

Heller examined thirty-two strains of anaerobes, all of which were

isolated from clinical cases of blackleg in cattle. She found that nineteen of these were *B. chauvæi* and thirteen *V. septique*. Further, she made a thorough review of the literature dealing with the subject, and, as a result, states: "Practical considerations lead to the following conclusions: cattle are frequently subject to spontaneous infection by members of two groups of anaerobic invaders, the blackleg group and the *V. septique* group. Both types of these infections are, in the vast majority of cases, diagnosed as blackleg, Rauschbrand or symptomatic anthrax. Infection by members of the first group is commoner than by members of the second group, but infection by members of the second group is by no means to be ignored, and probably should be considered in cattle immunisation. It is possible that a member of one group may be the predominating invader in one district and a member of the other in another, which indicates the necessity of determining the bacterial agents involved in blackleg infection in various districts."

Uchimura (2) divides his fifteen Rauschbrand strains into eleven true Rauschbrand, and four others, of which two were *V. septique* and two showed proteolytic characters. St. Ivanic (3) classifies his Rauschbrand strains into an atoxic and a toxic group, i.e. probably *B. chauvæi* and *V. septique*, for he states that the toxin of his toxic group is neutralised by what he calls antitoxic œdema serum prepared by the National Sero-therapeutic Institute in Vienna.

Graub (4), in discussing the results of immunising a number of cattle in Switzerland with germ-free blackleg filtrate, points out that *V. septique* was responsible for fifteen out of forty-eight cases in which the natural disease developed in animals so immunised. He moreever quotes the authority of Gabathuler of Davos and of Gerlach of Vienna for the statement that this organism is the causal agent of some cases of blackleg in the Canton of Graubund and in the Tyrol respectively. In Germany two types of Rauschbrand are apparently recognised: Fothscher Rauschbrand or true Rauschbrand and Kittscher Rauschbrand, which is caused by what is there known as the malignant œdema bacillus (probably *V. septique*). The State pay compensation to the owner for the loss of animals in the case of true Rauschbrand only.

Leclainche and Vallée (5) (*a*) distinguish between blackleg and gas gangrene in animals, and state that cases of the latter condition are due to wound infection by *V. septique*, as, for example, following parturition or in cases where there are abrasions of the tongue, pharynx, or teats. Among cases of true blackleg arising in the absence of any discoverable wound, they have met with some in which the causal organisms have shown themselves to be neither true

B. chauvœi nor true *V. septique*, but to be possessed of certain characters of both. They do not, however, recognise true *V. septique* as a cause of blackleg.

Sheep are known to be the subjects of blackleg, particularly in certain districts. Many cases have been shown to be due to infection with *B. chauvœi*, but here again it is possible that *V. septique* is sometimes responsible for the condition. In sheep, however, the latter organism assumes greater importance than it does in cattle on account of its significance in the disease known as braxy or bradsot. The first worker to state definitely that *V. septique* was the specific cause of bradsot was Zeissler (6), who described the organism under the name of the bacillus of Ghon and Sachs.

Notable earlier investigations into the nature of this disease were made by Neilsen (7) and by Jensen (8). The latter described his cultures very carefully, but did not identify them as *V. septique*. From eleven samples of bradsot material sent to her by Jensen, Heller isolated *V. septique* from seven, *B. chauvœi* from one, and in the remaining three she found no pathogenic organisms. Later Gaiger (9), in an account of his investigations in Scotland, confirms the view that *V. septique* is the cause of braxy, although his description of the nine strains which he studied in detail is not completely satisfactory as far as sugar fermentations are concerned. He states "that it was found to be very difficult to obtain any uniformity in the results which varied in different sub-cultures even of the same strain." Only four of these nine strains fermented salicin and lactose. Gaiger commits himself to the statement that "he had formed the general opinion that fermentation tests are uncertain and unreliable for the differentiation of pathogenic anaerobes." We can only say that we have found such tests very reliable for all our strains, both of *V. septique* and of *B. chauvœi*, and we believe that given pure cultures they are just as valuable in the differentiation of anaerobes as of aerobes, no more and no less. All the strains of *V. septique*, both of human and animal origin, which we have examined have fermented salicin and lactose with avidity.

Immunity.

The earlier measures adopted for the preventive inoculation of animals against *V. septique* and *B. chauvœi* have all involved the use of living organisms—either fully virulent or in an attenuated form—with or without the use of anti-serum. Examples which may be given are the classical methods of Arloing, of Kitt and of Leclainche and Vallée in the case of blackleg, and of Jensen in the

case of braxy. All of these have given good results, and are more or less widely used at the present time. Of late years, however, for obvious reasons, attention has been focussed on the value of germ-free filtrates as immunising agents against these organisms. It was Roux (10) who first pointed out in 1888 that filtrates of cultures of *V. septique* and *B. chauvœi* were efficient for immunising guinea-pigs, and that filtered serous fluid of animals dead of these infections was equally serviceable for this purpose. His methods were not, however, adopted on a large scale until comparatively recently, when other workers, notably Schčbl (11), Nitta (12), Eichhorn (13), and Graub and Zschokke (14) have testified to their efficacy. In so far as *B. chauvœi* is concerned, it is now accepted that such filtrates can be relied upon to induce a high degree of immunity against natural infection.

The only reference which we can find, apart from Roux's original work, to the use of a filtrate as an immunising agent against *V. septique* infection is contained in the article by Gaiger, to which we have already referred. Gaiger found that an injection of one or two doses of *V. septique* toxin in sheep enabled them to withstand a lethal dose of culture two or three weeks later, but that such animals were not immune when tested in six weeks' time—a result which is not in accordance with ordinary immunological experience. The same worker also used the toxin as a prophylactic against natural braxy infection, and records a considerable diminution in losses from this disease among sheep thus inoculated.

Our own efforts have been directed entirely to the immunisation of animals against *V. septique* and *B. chauvœi* by means of filtrates of artificial culture.

The medium which we have found most satisfactory for the production of good filtrates is a tryptic digest broth to which fresh minced muscle is added. The technique adopted in the preparation of the broth is very similar to that employed by Hartley (15), and is as follows :—

Fourteen kilogrammes of meat, from which fat and connective tissue have been removed as far as possible, are distributed into four buckets, 3·5 kilos per bucket, and 3 litres of tap water are added for every 2 kilos of meat. The meat is well mixed with the water and the buckets allowed to stand at room temperature overnight (16 to 18 hours). Next morning the contents of the buckets are steamed to 80° C. to destroy any antitryptic action of the muscle. The contents of each are then placed in large earthenware vessels and cooled to 45° C. by the addition of 0·8 per cent. anhydrous sodium carbonate solution. To bring the brew to a suitable volume and a

PH of about 9·2, 3 litres of this solution are required per 2 kilogrammes of muscle. The trypsin preparation and the preservative are now added. Forty cubic centimetres of the trypsin extract per kilogramme of meat used has been found to give satisfactory results. As a preservative during digestion, chloroform (30 c.c. per 2 kilos of meat) is the most satisfactory, owing to the ease with which it is eventually removed.

The digestion is allowed to proceed for six hours in the incubator at 37° C. with frequent stirring. The action of the trypsin is then stopped by the addition of normal hydrochloric acid to the brew bulked in a large cauldron provided with a steam jacket (350 c.c. acid per 14 kilos muscle). The destruction of the trypsin is completed by heating the brew to 100° C. and then filtering. It is important to filter as soon as possible after the digestion is completed and the enzyme destroyed. Filtration at this stage is very rapid, and the brew may be left in the acid condition overnight.

Early next morning the reaction is made alkaline by the addition of normal sodium hydroxide. The broth is distributed in quantities of 1,800 c.c. into Winchester quarts, to each of which 150 grams of fresh minced muscle (horseflesh or beef) are added and thoroughly mixed with the broth. The temperature is then raised to 100° C. When cool the broth is poured off and its reaction adjusted to PH 8. It is again heated to 100° C. to precipitate phosphates, filtered, poured back on to the meat and autoclaved, free steam being allowed to pass through for sixty minutes, after which the pressure is raised slowly to 10 pounds and maintained there for 20 minutes. The final reaction of the medium is approximately PH 7·8. The trypsin preparation has been obtained from fresh pancreas of the pig according to the directions of Cole and Onslow (16).

It has been our custom to inoculate each bottle of medium with 30 c.c. of a 24–48 hours' broth culture of the organism, and to add at the same time sufficient sterile glucose solution to give a concentration of 0·2 per cent. Growth takes place very actively in this medium at body temperature and is allowed to proceed for two to four days in the case of *V. septique* and for five days in the case of *B. chauvœi*, when filtration through Berkefeld candles is practised.

"Vibrion Septique" Filtrate or Toxin.

Filtered culture of *V. septique* contains a toxin which can easily be demonstrated by animal inoculation. When the organism is grown in the medium which we have described, the toxin reaches its maximum strength in from two to four days, after which, if kept in

the incubator, it gradually declines until after an incubation period of twenty days the filtrate is almost atoxic. We have found that the toxin remains very constant in potency so long as it is kept in a cold room and in the dark. One of our toxins so preserved is of practically the same value to-day as when it was first filtered eleven months ago. At room temperature and exposed to the light it deteriorates much more quickly.

The general properties of the toxin have been fully described by Robertson (17). It produces rapid death in animals by intravenous inoculation, the symptoms shown being those of respiratory disturbance, paralysis and convulsions. It is not fatal by subcutaneous inoculation unless large quantities are given, but it does cause marked local reaction in the form of swelling and exudate followed by extensive necrosis. The intravenous inoculation of rabbits may be practised in estimating the potency of a given toxin, but where large numbers of tests have to be carried out this method becomes very expensive, and it is better to use smaller animals.

Most of our titrations have been carried out quite satisfactorily in mice. Guinea-pigs may be used for the purpose and are equally good, but in them the actual injection is more troublesome, as it necessitates anæsthetising the animal and making an incision through the skin. We have found that the most convenient vein for this purpose lies on the outer side of the leg just above the hock, whence it runs in an upward and inward direction over the back of the limb.

TABLE I.—TITRATION OF "VIBRION SEPTIQUE" TOXIN INTRAVENOUSLY IN MICE.

Mouse.	Weight.	Dose.	Result.
A	17 grams	0·25 c.c.	Died 3 mins.
B	17 grams	0·25 c.c.	Died 2 mins.
C	16 grams	0·1 c.c.	Died 5 mins.
D	18 grams	0·1 c.c.	Died 4 mins.
E	17 grams	0·05 c.c.	Died 55 mins.
F	16 grams	0·05 c.c.	Died 50 mins.
G	17 grams	0·025 c.c.	Died 130 mins.
H	17 grams	0·025 c.c.	Died 114 mins.
J	18 grams	0·01 c.c.	Died 48 hrs. (approx.).
K	17 grams	0·01 c.c.	Died 24 hrs. (approx.).
L	16 grams	0·005 c.c.	Died 72 hrs. (approx.).
M	17 grams	0·005 c.c.	Died 72 hrs. (approx.).
N	18 grams	0·0025 c.c.	Survived.
O	17 grams	0·0025 c.c.	Survived.
P	16 grams	0·001 c.c.	Survived.
Q	17 grams	0·001 c.c.	Survived.

A typical titration of *V. septique* toxin intravenously in mice is shown in Table 1 and in guinea-pigs in Table 2. Of this toxin 0·1 c.c. was sufficient to kill a medium sized rabbit, so that a comparison shows that the minimum lethal dose of toxin for a guinea-pig is about ten times, and for a medium-sized rabbit about twenty times that for a mouse. A glance at Table 1 will show that where mice of approximately equal weights are used, the time elapsing between injection and death increases as the dose decreases.

TABLE 2.—TITRATION OF "VIBRION SEPTIQUE" TOXIN INTRAVENOUSLY IN GUINEA-PIGS.

Guinea-Pig.	Weight.	Dose.	Time.	Result.
A	420 grams	0·05 c.c.	11.50 a.m.	Died overnight.
B	375 grams	0·06 c.c.	11.55 a.m.	Found dead 4.55 p.m.
C	390 grams	0·07 c.c.	12.0 noon.	Died 2.31 p.m.
D	415 grams	0·08 c.c.	12.5 p.m.	Died 2.30 p.m.
E	390 grams	0·09 c.c.	12.8 p.m.	Died 1.30 p.m.
F	380 grams	0·1 c.c.	12.12 p.m.	Died 12.33 p.m.
G	400 grams	0·15 c.c.	12.15 p.m.	Died 1.18 p.m.
H	400 grams	0·2 c.c.	12.19 p.m.	Died 12.26 p.m.
J	400 grams	0·25 c.c.	12.24 p.m.	Died 12.30 p.m.

TABLE 3.—TITRATION OF "VIBRION SEPTIQUE" TOXIN AGAINST ANTITOXIN INTRAVENOUSLY IN MICE.

Mouse.	Dose.			Result.
	"V. Septique" Toxin		*Antitoxin.*	
A	0·5 c.c.	+	0·003125 c.c.	Died 3 mins.
B	0·5 c.c.	+	0·00625 c.c.	Died 6 mins.
C	0·5 c.c.	+	0·0125 c.c.	Delayed death.
D	0·5 c.c.	+	0·025 c.c.	Lived.
E	0·5 c.c.	+	0·05 c.c.	Lived.
F	0·5 c.c.	+	0·1 c.c.	Lived.
Controls.				
G	0·5 c.c.		Toxin only	Died 3 mins.
H	0·5 c.c.		Toxin only	Died 5 mins.
J	0·25 c.c.		Toxin only	Died 5 mins.
K	0·25 c.c.		Toxin only	Died 7 mins.
L	0·5 c.c.		Toxin + 0·2 c.c. normal serum	Died 3 mins.

We have used the same methods for titrating a toxin against a known antitoxin in an endeavour to find the point of neutrality

before preparing toxin antitoxin mixtures for immunising purposes. Tables 3 and 4 show such titrations in mice and guinea-pigs respectively.

TABLE 4.—TITRATION OF "VIBRION SEPTIQUE" TOXIN AGAINST ANTITOXIN INTRAVENOUSLY IN GUINEA-PIGS.

Guinea-Pig.	Dose.			Result.
	"V. Septique" *Toxin.*		*Antitoxin.*	
A	1 c.c.	+	0·00625 c.c.	Died 7 mins.
B	1 c.c.	+	0·0125 c.c.	Died overnight.
C	1 c.c.	+	0·025 c.c.	Lived.
D	1 c.c.	+	0·05 c.c.	Lived.
Controls.				
E	0·75 c.c.		Nil	Died 4 mins.
F	1 c.c.	+	0·2 c.c. normal serum	Died 3 mins.

Table 5 represents the titration of the same toxin and antitoxin with a view to testing the local effect of the subcutaneous injection of mixtures of varying strength. A comparison with Table 4 shows that the point of neutrality of the mixtures is indicated equally well for most practical purposes by either of these methods, although for really accurate work we should prefer the intravenous injection.

TABLE 5.—TITRATION OF "VIBRION SEPTIQUE" TOXIN ANTITOXIN MIXTURES FOR LOCAL EFFECT SUBCUTANEOUSLY IN GUINEA-PIGS.

Guinea-Pig.	Dose.			Result.
	"V. Septique" *Antitoxin.*		*Toxin.*	
A	0·02 c.c.	+	2 c.c.	Swelling and exudate.
B	0·02 c.c.	+	2 c.c.	Swelling and exudate.
C	0·03 c.c.	+	2 c.c.	Slight swelling and exudate.
D	0·03 c.c.	+	2 c.c.	Slight swelling and exudate.
E	0·04 c.c.	+	2 c.c.	Slight swelling only.
F	0·04 c.c.	+	2 c.c.	Slight swelling only.
G	0·05 c.c.	+	2 c.c.	Nil.
H	0·05 c.c.	+	2 c.c.	Nil.

IMMUNISATION OF GUINEA-PIGS AGAINST "V. SEPTIQUE."

Our first attempts in this direction consisted in the subcutaneous injection of toxin, but although the animals acquired a reasonable

degree of immunity after two doses had been given, we were compelled to abandon this method as a practical measure owing to the serious local effects caused by the administration. We were obliged therefore to obviate these effects either by using a mixture of toxin and antitoxin, or by so modifying the toxin as to reduce its toxicity to a minimum whilst at the same time preserving its immunising properties. Both of these methods proved successful.

TABLE 6.—IMMUNISATION OF GUINEA-PIGS WITH SINGLE DOSE OF "VIBRION SEPTIQUE" MIXTURE (50 PER CENT. UNDER-NEUTRALISED).

Guinea-Pig.	Inoculated, 23/10/23.	Tested, 13/11/23.	Result.
	"V. Septique" Mixture.	*"V. Septique" Toxin I.V.*	
A	(0·02 c.c. antitoxin + 2 c.c. toxin)	2 M.L.D. (0·1 c.c.)	Lived.
B	(0·02 c.c. antitoxin + 2 c.c. toxin)	2 M.L.D. (0·1 c.c.)	Lived.
C	(0·02 c.c. antitoxin + 2 c.c. toxin)	2 M.L.D. (0·1 c.c.)	Died 48 hours.
D	(0·02 c.c. antitoxin + 2 c.c. toxin)	5 M.L.D. (0·25 c.c.)	Died 16 mins.
E	(0·02 c.c. antitoxin + 2 c.c. toxin)	5 M.L.D. (0·25 c.c.)	Died 1 hour (approx.).
Controls.			
F	Nil	2 M.L.D. (0·1 c.c.)	Died overnight.
G	Nil	2 M.L.D. (0·1 c.c.)	Died 5 hours.
H	Nil	5 M.L.D. (0·25 c.c.)	Died 13 mins.

As was to be expected, we found that a double dose gave a much stronger immunity than a single one. A comparison of Tables 6 and 7 illustrates this point in the case of a toxin antitoxin mixture. From these it will be seen that we employed two methods as a test of immunity: (*a*) The intramuscular injection of culture and (*b*) the intravenous injection of toxin. We have found the intravenous injection of toxin to be just as reliable as a dose of culture in testing immunity, and we prefer its use, since the strength of the amount given can be much more accurately measured than is the case with culture.

When two doses are given, the first may consist of a toxin anti-

TABLE 7.—IMMUNISATION OF GUINEA-PIGS WITH DOUBLE INOCULATION OF 50 PER CENT. UNDER-NEUTRALISED "VIBRION SEPTIQUE" TOXIN ANTITOXIN MIXTURE.

Guinea-Pig.	1st Inoculation, 23/10/23.	2nd Inoculation, 5/11/23.	Tested. 20/11/23.	Result.
	"V. Septique" Mixture.	*"V. Septique" Mixture.*	*"V. Septique" Toxin IV.*	
A	2 c.c.	2 c.c.	5 M.L.D. (0·25 c.c.)	Lived.
B	2 c.c.	2 c.c.	5 M.L.D. (0·25 c.c.)	Lived.
C	2 c.c.	2 c.c.	5 M.L.D. (0·25 c.c.)	Lived.
D	2 c.c.	2 c.c.	8 M.L.D. (0·4 c.c.)	Lived.
E	2 c.c.	2 c.c.	8 M.L.D. (0·4 c.c.)	Died 7 mins.
Controls.				
F	Nil	Nil	2 M.L.D. (0·1 c.c.)	Died overnight.
G	Nil	Nil	2 M.L.D. (0·1 c.c.)	Died overnight.
H	Nil	Nil	5 M.L.D. (0·25 c.c.)	Died 10 mins.
J	Nil	Nil	10 M.L.D. (0·5 c.c.)	Died 7 mins.
			28/11/23	
	"V. Septique" Mixture.	*"V. Septique" Mixture.*	*"V. Septique" Culture I.M.*	
K	2 c.c.	2 c.c.	0·05 c.c.	Lived.
L	2 c.c.	2 c.c.	0·05 c.c.	Lived.
Control.				
M	Nil	Nil	0·05 c.c.	Died 24–48 hours.
			1/12/23	
	"V. Septique" Mixture.	*"V. Septique" Mixture.*	*"V. Septique" Culture I.M.*	
N	2 c.c.	2 c.c.	0·05 c.c.	Lived.
O	2 c.c.	2 c.c.	0·05 c.c.	Lived.
P	2 c.c.	2 c.c.	0·05 c.c.	Lived.
Controls.				
Q	Nil	Nil	0·05 c.c.	Died 24–48 hours.
R	Nil	Nil	0·05 c.c.	Died 24 hours.

TABLE 8.—IMMUNISATION OF GUINEA-PIGS WITH "VIBRION SEPTIQUE" TOXIN ANTITOXIN MIXTURE AND TOXIN ALONE.

Guinea-Pig.	1st Inoculation. 15/9/23.	2nd Inoculation. 1/10/23.	Test. 9/10/23.	Result.
	2 *c.c. Neutral T.A.M." V. Septique" Antitoxin Toxin.*	*"V. Septique" Toxin.*	*"V. Septique" Toxin I.V.*	
A	0·5 c.c. + 2 c.c.	0·5 c.c.	2 M.L.D. (0·1 c.c.)	Lived.
B	0·5 c.c. + 2 c.c.	0·5 c.c.	5 M.L.D. (0·25 c.c.)	Died 48 hours.
C	0·5 c.c. + 2 c.c.	0·3 c.c.	2 M.L.D. (0·1 c.c.)	Lived.
D	0·5 c.c. + 2 c.c.	0·3 c.c.	5 M.L.D. (0·25 c.c.)	Lived.
E	0·5 c.c. + 2 c.c.	0·2 c.c.	2 M.L.D. (0·1 c.c.)	Lived.
F	0·5 c.c. + 2 c.c.	0·2 c.c.	5 M.L.D. (0·25 c.c.)	Lived.
Control.				
G	Nil	Nil	5 M.L.D. (0·25 c.c.)	Died 70 mins.

toxin mixture and the second of a small quantity of neat toxin, for in response to the first dose the animal acquires sufficient immunity to protect it from the serious local effects of the toxin. Table 8 shows the result of such an experiment.

In the preparation of mixtures for immunising purposes the proportion of serum added should be the least amount necessary to prevent too great a local reaction. A comparison of Tables 9 and 10 shows that, of two mixtures in which the same amount of toxin was used, the one containing the lesser amount of serum gave the higher degree of immunity.

MODIFIED TOXIN.

By adding a small percentage of formalin to a batch of toxin and keeping it at a temperature of 30° C. for a week we obtained an atoxic product which retained its immunising properties as shown in Table 11. We think we ought to state, however, that until we have completed some further experiments, we do not feel that we are in a position to define the exact conditions necessary to bring about this result. The danger is that the toxic and immunising properties may disappear simultaneously.

"BACILLUS CHAUVŒI" FILTRATE.

The filtrates which we have prepared from cultures of this organism have all proved to be quite atoxic for animals by whatever

TABLE 9.—IMMUNISATION OF GUINEA-PIGS WITH A 25 PER CENT. UNDER-NEUTRALISED "VIBRION SEPTIQUE" MIXTURE. DOUBLE INOCULATION.

Guinea-Pig.	1st Inoculation, 5/11/23.	2nd Inoculation, 28/12/23.	Tested, 4/3/24.	Result.
	"V. Septique" Mixture.	*"V. Septique" Mixture.*	*Toxin I.V.*	
A	2 c.c.	2 c.c.	2 M.L.D. (0·1 c.c.)	Lived.
B	2 c.c.	2 c.c.	2 M.L.D. (0·1 c.c.)	Lived.
C	2 c.c.	2 c.c.	5 M.L.D. (0·25 c.c.)	Lived.
D	2 c.c.	2 c.c.	5 M.L.D. (0·25 c.c.)	Died 24 hours.
E	2 c.c.	2 c.c.	5 M.L.D. (0·25 c.c.)	Died 15 mins.
Controls.				
F	Nil	Nil	2 M.L.D. (0·1 c.c.)	Died 14 mins.
G	Nil	Nil	2 M.L.D. (0·1 c.c.)	Died 24 hours.
H	Nil	Nil	2 M.L.D. (0·1 c.c.)	Died 24 hours.
J	Nil	Nil	2 M.L.D. (0·1 c.c.)	Died 4 hours.
K	Nil	Nil	5 M.L.D. (0·25 c.c.)	Died 8 mins.
L	Nil	Nil	10 M.L.D. (0·5 c.c.)	Died 2 mins.

channel they have been introduced. This is in accordance with the findings of most workers on the subject. On the other hand, *B. chauvæi* toxin has been prepared, notably by Leclainche and Vallée (5) (*b*), who first described its properties in 1900. Quite recently Okuda (18) has been successful in obtaining a similar toxin. Apparently, however, the majority of strains of this organism are non-toxigenic. Haslam and Lumb (19) consider that the immunising power of such filtrates is not dependent upon toxicity. However that may be, it is now established that atoxic filtrates of this organism may be quite efficient as immunising agents.

Unfortunately, in the absence of a demonstrable toxin, there does not exist at the moment any reliable quick method of estimating the value of a given filtrate. An endeavour has been made by Scott (20) to devise means whereby this can be done. He compares the "aggressive" power of various filtrates by testing the amounts

TABLE 10.—IMMUNISATION OF GUINEA-PIGS WITH A 50 PER CENT. UNDER-NEUTRALISED "VIBRION SEPTIQUE" MIXTURE. DOUBLE INOCULATION.

Guinea-Pig	1st Inoculation 5/11/23.	2nd Inoculation, 28/11/23.	Tested, 4/3/24.	Result.
	"V. Septique" Mixture.	*"V. Septique" Mixture.*	*Toxin I.V.*	
A	2 c.c.	2 c.c.	2 M.L.D. (0·1 c.c.)	Lived.
B	2 c.c.	2 c.c.	2 M.L.D. (0·1 c.c.)	Lived.
C	2 c.c.	2 c.c.	5 M.L.D. (0·25 c.c.)	Lived.
D	2 c.c.	2 c.c.	10 M.L.D. (0·5 c.c.)	Lived.
Controls.				
E	Nil	Nil	2 M.L.D. (0·1 c.c.)	Died 14 mins.
F	Nil	Nil	2 M.L.D. (0·1 c.c.)	Died 24 hours.
G	Nil	Nil	2 M.L.D. (0·1 c.c.)	Died 24 hours.
H	Nil	Nil	2 M.L.D. (0·1 c.c.)	Died 4 hours.
J	Nil	Nil	5 M.L.D. (0·25 c.c.)	Died 8 mins.
K	Nil	Nil	10 M.L.D. (0·5 c.c.)	Died 2 mins.

of them that must be added to a given quantity of an emulsion of washed *B. chauvœi* spores to produce death when inoculated into guinea-pigs. In our hands this did not prove very satisfactory owing chiefly to the varying susceptibility that exists among individual guinea-pigs towards infection by this organism. It may be said, however, to provide some slight indication. The accurate standardisation of *B. chauvœi* filtrate is therefore impossible at the present time. Each batch of the material must be tested for immunising power on animals.

IMMUNISATION OF GUINEA-PIGS WITH "BACILLUS CHAUVŒI" FILTRATE.

Tables 12 and 13 show typical examples of the results which we have obtained in immunising guinea-pigs with *B. chauvœi* filtrate. Here again it will be seen that the inoculation of two doses stimulates the production of a higher degree of immunity than does a single dose.

TABLE 11.—IMMUNISATION OF GUINEA-PIGS WITH TWO DOSES OF "VIBRION SEPTIQUE" TOXIN MODIFIED BY ADDING 0·3 PER CENT. FORMALIN AND MAINTAINING AT A TEMPERATURE OF 30° C. FOR A WEEK.

Guinea-Pig.	1st Inoculation, 13/10/23.	2nd Inoculation, 25/11/23.	Tested 14 Days Later.	Result.
	"V. Septique" Toxin.	*"V. Septique" Toxin.*	*"V. Septique" Toxin IV.*	
A	2 c.c. toxin subcutaneously	2 c.c. toxin subcutaneously	2 M.L.D. (0·1 c.c.)	Lived.
B	2 c.c. toxin subcutaneously	2 c.c. toxin subcutaneously	5 M.L.D. (0·25 c.c.)	Lived.
C	2 c.c. toxin subcutaneously	2 c.c. toxin subcutaneously	5 M.L.D. (0·25 c.c.)	Lived.
D	2 c.c. toxin subcutaneously	2 c.c. toxin subcutaneously	5 M.L.D. (0·25 c.c.)	Died 48 hours.
Controls.				
E	Nil	Nil	2 M.L.D. (0·1 c.c.)	Died overnight.
F	Nil	Nil	2 M.L.D. (0·1 c.c.)	Died overnight.
G	Nil	Nil	2 M.L.D. (0·1 c.c.)	Died overnight.
H	Nil	Nil	2 M.L.D. (0·1 c.c.)	Died overnight.

TABLE 12.—IMMUNISATION OF GUINEA-PIGS WITH "B. CHAUVŒI" FILTRATE.

Guinea-Pig.	Immunised.	Date.	Tested.	Date.	Result.
	"B. Chauvœi" Filtrate.		1 *M.L.D.* *"B. Chauvœi" Culture.*		
A	2·5 c.c.	17/7/23	0·5 c.c. I.M.	18/8/23	Lived.
B	2·5 c.c.	17/7/23	0·5 c.c. I.M.	18/8/23	Lived.
C	2·5 c.c.	17/7/23	0·5 c.c. I.M.	18/8/23	Lived.
D	2·5 c.c.	17/7/23	0·5 c.c. I.M.	18/8/23	Died 48 hours.
E	2·5 c.c.	17/7/23	0·5 c.c. I.M.	18/8/23	Lived.
F	2·5 c c	17/7/23	0·5 c.c. I.M.	18/8/23	Lived.
G	2·5 c.c.	17/7/23	0·5 c.c. I.M.	18/8/23	Lived.
H	2·5 c.c.	17/7/23	0·5 c.c. I.M.	18/8/23	Died 48 hours.
J	2·5 c.c.	17/7/23	0·5 c.c. I.M.	18/8/23	Lived.
Controls.			1 *M.L.D.* *C. Culture.*		
K	Nil	17/7/23	0·5 c.c. L.M.	18 8/23	Died overnight.
L	Nil	17/7/23	0·5 c.c. L.M.	18/8/23	Died overnight.
M	Nil	17/7/23	0·5 c.c. L.M.	18/8/23	Died overnight.
N	Nil	17/7/23	0·5 c.c. L.M.	18/8/23	Died overnight.

TABLE 13.—IMMUNISATION OF GUINEA-PIGS WITH TWO DOSES OF "B. CHAUVŒI" FILTRATE, SUBCUTANEOUSLY.

Guinea-Pig.	1st Inoculation, 29/9/23.	2nd Inoculation, 2/10/23.	Tested	Result.
	"B. Chauvœi" Filtrate.	*"B. Chauvœi" Filtrate.*	*"B. Chauvœi" Culture.*	
A	2 c.c.	2 c.c.	1 c.c. I.M. 15/10/23	Lived.
B	2 c.c.	2 c.c.	0·5 c.c. I.M. 29/10/23	Lived.
C	2 c.c.	1 c.c.	1 c.c. I.M. 15/10/23	Lived.
D	2 c.c.	1 c.c.	0·5 c.c. I.M. 29/10/23	Lived.
Controls.				
F	Nil	Nil	1 c.c. I.M. 15/10/23	Died 24 hours.
G	Nil	Nil	0·5 c.c. I.M. 29/10/23	Died 24–48 hours.
H	Nil	Nil	0·5 c.c. I.M. 29/10/23	Died 24–48 hours.
J	Nil	Nil	0·5 c.c. I.M. 29/10/23	Died 24–48 hours.

IMMUNISATION OF GUINEA-PIGS AGAINST "VIBRION SEPTIQUE" AND "BACILLUS CHAUVŒI" SIMULTANEOUSLY.

By inoculation of *V. septique* toxin antitoxin mixture combined with *B. chauvœi* filtrate, we have succeeded in rendering guinea-pigs refractory to both organisms simultaneously.

EXPERIMENTS ON SHEEP.

No. 1. IMMUNISATION AGAINST "VIBRION SEPTIQUE."

SHEEP A1. *Inoculated* on **28/11/23** with 5 c.c. of a 50 per cent. underneutralised *V. septique* toxin antitoxin mixture (T.A.T.) subcutaneously. *Tested* on **23/2/24** with 4 c.c. of *V. septique* liver broth culture injected intramuscularly (I.M.). *Result.*—Died a few hours after the Control Sheep E17.

SHEEP A2. *Inoculated* on **3/12/23** with 5 c.c. of a 25 per cent. underneutralised *V. septique* T.A.T. mixture subcutaneously. The same dose was repeated on **19/2/24**. *Tested* on **25/3/24** with 4 c.c. of *V. septique* liver broth culture I.M. *Result.*—The animal remained quite healthy and showed no lameness or other signs of reaction. Control Sheep E19 died within 24 hours.

SHEEP A3.—*Inoculated* on **10/12/23** with 5 c.c. of a 25 per cent. underneutralised *V. septique* T.A.T. mixture subcutaneously. On **29/2/24** 10 c.c. of *V. septique* toxin was injected subcutaneously. *Tested* on **25/3/24** with 4 c.c. of *V. septique* liver broth culture I.M. *Result.*—The animal proved to be immune. Control Sheep E19 died within 24 hours.

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No. 2. Immunisation against "Bacillus Chauvœi."

Sheep D14. *Inoculated* on 28/11/23 with 5 c.c. of *B. chauvœi* filtrate subcutaneously. *Tested* on 25/3/24 with 3 c.c. of *B. chauvœi* liver broth culture I.M. *Result.*—Remained perfectly healthy. Control Sheep E20 died 24 to 36 hours after inoculation with the same dose.

Sheep D15. *Inoculated* on 28/11/23 in the same manner as Sheep D14, but not tested until 5/7/24, when it received 3 c.c. of *B. chauvœi* culture I.M. and survived without showing any untoward symptoms. For control sheep see E22.

No. 3. Simultaneous Immunisation against "Vibrion Septique" and "Bacillus Chauvœi."

Sheep B5. *Inoculated* on 17/12/23 with 5 c.c. of a 25 per cent. underneutralised *V. septique* T.A.T. mixture and 5 c.c. of *B. chauvœi* filtrate subcutaneously. *Tested* on 23/2/24 with 4 c.c. of *V. septique* culture M.I. *Result.*—Died a few hours after Control Sheep E17.

Sheep B6. *Inoculated* on 17/12/23 with the same mixture as Sheep B5. The dose was repeated 29/2/24. *Tested* (*a*) on 25/3/24 with 3 c.c. of *B. chauvœi* culture I.M. *Result.*—Remained perfectly healthy. For control sheep see E20. On 5/4/24 the animal was tested for immunity against *V. septique* with 4 c.c. of *V. septique* culture I.M. *Result.*—Survived without showing any symptoms. Control Sheep E21 died within 24 hours.

Sheep B7.—This animal was immunised and tested in the same manner and on the same dates as Sheep B6 with entirely similar results.

Sheep B8. *Inoculated* on 17/12/23 with 5 c.c. of a 25 per cent. underneutralised *V. septique* T.A.T. mixture and 5 c.c. of *B. chauvœi* filtrate subcutaneously. On 29/2/24 a second immunising dose of 5 c.c. *V. septique* toxin and 5 c.c. *B. chauvœi* filtrate was given. *Tested* on 25/3/24 with 4 c.c. *V. septique* culture I.M. *Result.*—Remained perfectly healthy. For control sheep see E19. By an oversight it has not been tested for immunity against *B. chauvœi* at the time of this publication.

Sheep C9. *Inoculated* on 17/12/23 with 5 c.c. of a 25 per cent. underneutralised *V. septique* T.A.T. mixture and 5 c.c. of *B. chauvœi* filtrate subcutaneously. The dose was repated on 24/12/23. *Tested* (*a*) on 23/2/24 against *V. septique* with 4 c.c. culture I.M. *Result.*—Showed lameness which soon passed off, but no other untoward symptoms. For control sheep see E17. *Tested* (*b*) on 5/7/24 against *B. chauvœi* with 3 c.c. culture I.M. *Result.*—Remained perfectly healthy. For control sheep see E22.

Sheep C11.—This animal was immunised in exactly the same manner and on the same dates as Sheep C9. It was *tested* (*a*) against *V. septique* on 25/3/24 with 4 c.c. culture I.M. *Result.*—Showed nothing but a very slight lameness, which soon passed off. For control sheep see E19. *Tested* (*b*) against *B. chauvœi* on 5/7/24 with 3 c.c. culture I.M. *Result.*—Survived. Control Sheep E22 was killed at the point of death 24 hours after infection.

Sheep C12.—This animal was immunised in exactly the same manner and on the same dates as Sheep C9. *Tested* (*a*) on 25/3/24 against *B. chauvœi* with 3 c.c. culture I.M. *Result.*—Remained quite healthy. For control sheep see E20. *Tested* (*b*) on 5/4/24 against

V. septique with 4 c.c. culture I.M. *Result.*—It again remained quite healthy. For control sheep see E21.

CONTROL SHEEP E17. *Inoculated.*—23/2/24 with 4 c.c. *V. septique* culture (I.M.). Died within 24 hours.

CONTROL SHEEP E19. *Inoculated.*—25/3/24 with 4 c.c. *V. septique* culture (I.M.). Died within 24 hours.

CONTROL SHEEP E20. *Inoculated.*—25/3/24 with 3 c.c. *B. chauvœi* culture (I.M.). Died 24 to 36 hours later.

CONTROL SHEEP E21. *Inoculated.*—5/4/24 with 4 c.c. *V. septique* culture (I.M.). Died within 24 hours.

CONTROL SHEEP E22. *Inoculated.*—5/7/24 with 3 c.c. *B. chauvœi* culture (I.M.). Was killed at the point of death 24 hours after injection.

Numerous guinea-pig experiments were done simultaneously with those on sheep confirming the virulence of the cultures. We found that about ten times the guinea-pig minimum lethal dose of *B. chauvœi* culture was sufficient to kill sheep within 24–36 hours. Of the *V. septique* culture about eighty times the minimum lethal dose was necessary.

CONCLUSIONS.

From the results which we have thus obtained in sheep, the following conclusions may be drawn :—

1. That a single dose of *V. septique* T.A.T. mixture does not produce sufficient immunity to enable the animal to withstand inoculation with a certain fatal dose of culture after an interval of two months. See Sheep A1 and B5.

2. That two doses of such a mixture are efficient for this purpose up to five months at least.

3. That although a reasonably strong immunity is produced when the interval between the two immunising doses is as short as one week, yet it appears that it is an advantage to give a longer interval between these doses. As a practical measure we would suggest that a fortnight be allowed.

4. That a single dose of *B. chauvœi* filtrate affords good protection against a certain fatal dose of culture for a period of at least six months.

5. That two doses of a combination of these products immunises an animal simultaneously against both organisms.

We wish to thank those members of the veterinary profession who, in response to our appeal, have sent us material from cases of blackleg, and we gratefully acknowledge the help which we have received from our colleagues of the Wellcome Laboratories, and particularly from Dr. A. F. Watson, who has kindly superintended the preparation of the media which we have used.

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Clinical Articles

THE RATIONAL TREATMENT OF RESPIRATORY DISEASE IN THE HORSE.

BY LIEUT.-COLONEL RAINEY, C.B.E., M.R.C.V.S.,
London.

IN the year 1897 Sir Frederick Smith (then Major F. Smith, A.V.D.) published in the *Journal of Comparative Pathology* (Vol. X) a characteristically accurate and scientific account of his observations in the experimental treatment of a considerable series of cases of respiratory disease in the horse.

These observations established with a reasonable degree of certainty that fresh air, careful nursing, possibly the administration of iodine in bolus, and the avoidance of drenching, sufficed for the treatment of pneumonia in the horse.

This careful work, like much else that has been done by Sir Frederick Smith, did not receive the attention it deserved at the hands of the veterinary profession as a whole. The majority of practitioners long continued (and in many instances have continued to the present day) to practise elaborate systems of treatment. Similarly, the text-books that have been published from time to time contain (so far as the writer knows) no specific reference to Sir F. Smith's observations on the matter, although Professor Wooldridge, in his recently published *Encyclopedia of Veterinary Medicine*, mentions the fact that some practitioners rely upon fresh air and nursing alone in the treatment of equine pneumonia.

The Great War, with its many thousands of cases of pneumonia, came and went without any improvement being made on the above-mentioned simple principles.

Trial on an unprecedented scale was made of every hopeful form of treatment, including the intravenous injection of formalin, the subcutaneous injection of camphor in oil, vaccines, and serum, but with the possible exception of the last named agent, freshly prepared, nothing of any value was discovered.

The writer has for many years relied upon the system described by Sir F. Smith with some slight modifications.

These include as a rule the administration of iodine and potassium iodide in electuary instead of in bolus and the invariable use of common salt in abundance.

An elegant electuary is made by pounding together in a glass mortar ½ ounce of resublimated iodine with a ¼ ounce of potassium iodide and then adding little by little, while the pounding continues, 1 ounce of glycerine, the whole being subsequently well mixed with 14 ounces of thick black treacle. An impressive odour is given by the addition of a few drops of oil of aniseed or eucalyptus.

In many cases a horse affected with pneumonia will lick rock salt continuously; when this is not so the salt is given in an electuary.

The dietary receives the utmost attention because in the acute stages of pneumonia either green stuff or roots (depending on the season) and choice hay are absolutely necessary.

Water is constantly before the animal, and on no account is it rendered unpalatable by dissolving in it powders of magnesium sulphate, potassium nitrate, or other salts, which are in fact of no

therapeutic value in these cases. There is no disease of the horse (excepting purpura hæmorrhagica, which is similarly treated) in which an animal so clearly hovers between life and death as pneumonia, so that no adverse circumstance, however slight, affecting the patient can be ignored, and to put a fastidious animal more or less off its drinking water for several hours or days by making the water distasteful is undoubtedly an adverse circumstance.

The same applies to giving "powders" in the food; the practice should be avoided in the treatment of febrile diseases.

When an indisputably airy loose box or open shed cannot be obtained, the animal, if the case is critical, is taken out of the stable and stood in wet weather under an improvised awning, or, if it is not raining, in the open.

Any form of drenching, whether with medicine or liquid nourishment, is of course out of the question, and it is believed that the same applies to the intravenous injection of formalin, the intratracheal injection of iodine, and other so-called heroic measures. The application of mustard to the sides is unnecessary and, so far as it may add to the discomfort of the patient, is contra-indicated.

Thirty-four consecutive cases of established pneumonia, three cases of simple pleurisy, and four cases of purpura hæmorrhagica, have been treated on these lines in the writer's practice during the past fifteen months without a single death or untoward sequel. Some of the cases were slight, but, on the other hand, some were so severe that recovery seemed too much to expect.

It should be noted that most of these cases were treated in unfavourable surroundings in a congested industrial district of East London. In fact in some instances treatment was refused until the owner reluctantly agreed to stand the horse out of the stable altogether.

The worst case of all stood tied to a cart under an outside stairway in a yard for ten days in the month of January. It was evident in this case that death would have occurred shortly if the animal had remained in its unventilated stall with its back to a steaming manure pit. The respirations were over 60, the pulse was barely perceptible, the anus was open, and the horse had taken no food and very little water for two days.

In one case that occurred in a locality where a sheltered field was available, the animal (which appeared to be *in extremis*) was rugged up and turned out of its dark close stable into the field (also in winter), and receiving as medicine only rock salt, made a complete recovery.

It should be unnecessary to go further than this; the same

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results can be obtained by any practitioner working on similar lines.

Recovery cannot, of course, occur in a case that, while suffering from pneumonia, has been worked to the point of death. Only one such case was brought to the writer, who refused treatment and advised immediate destruction because the odour of the breath indicated gangrene of the lung.

Post-mortem revealed gangrenous pneumonia, paricarditis, and pleurisy, with organised adhesions of at least ten days' standing, during which time the animal had been drawing 30 cwt. at a trotting pace, a most remarkable instance of physical endurance and human ignorance and neglect.

To leave the established facts and inquire into the causes of success in this treatment is to enter the realm of hypothesis except in the matters of open air and alimentation. In these respects it is obvious that too much care cannot be taken. Every draught of air inspired that is less than 100 per cent. fresh falls short, to the extent of its vitiation, of what the patient requires. Every day that the amount of food and water, especially water, ingested is less than that which the animal could, with more care, be induced to take, is a day to the bad not only as regards the course of the disease but the period of convalescence.

Of the thirty-seven cases of respiratory disease and four cases of purpura hæmorrhagica under review it is certain that thirty-one of the former and one of the latter would have recovered without any further treatment than fresh air and nursing, and it is probable that recovery would not have been delayed for lack of other measures.

The remaining six cases of pneumonia and three cases of purpura hæmorrhagica were critical; a few drenches might have killed any of them. All the purpura cases and twenty-four of the pneumonia cases received iodine in electuary; two of the worst cases of pneumonia received as medicine only sodium chloride.

The conclusion reached concerning the administration of iodine was that, while there is insufficient evidence of its efficacy in the treatment of pneumonia, it appears to be beneficial in the treatment of purpura hæmorrhagica, and the writer is unwilling to abandon its use altogether in the former disease.

The action of iodine in pneumonia (if any) may be to replace the internal secretion of the thyroid gland which may be in abeyance in the acute stages of the disease. If it has not that action it most likely has none. The action of sodium chloride is less obscure in that at least it probably helps to maintain the normal composition of the blood.

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The need for sodium chloride is evident from the craving that many equine subjects of pneumonia exhibit.

One animal suffering from purpura hæmorrhagica during three days consumed over a pound of bar table salt. It would take a piece of the bar of salt weighing about 3 ounces into its mouth and masticate it as though it were corn.

It is not believed that thoracic puncture with trocar and canula is necessary or beneficial as a routine measure. The good results following this technique that have been reported in veterinary literature are believed to have been due to concentration on this point and consequent avoidance of undesirable medication. The fact that equally good results can be obtained without puncture seem to justify the belief that it is generally unnecessary.

Pneumonia in the horse is typical of a class of diseases whose severity and issue depend upon circumstances and coincidence.

Given a series of cases, however long, in which early detection of the disease has ensured to the patient from the beginning complete rest in favourable surroundings and in which no untoward sequel, such as pulmonary abscess, or gangrene, develops, recovery under rational treatment is certain in every case.

Consequently it has happened from time to time that different sorts of harmless medication and vaccine and serotherapy have received the credit that was due to coincidence, fresh air, and the healing power of nature.

A veterinary practitioner of the writer's acquaintance, who obtained satisfactory results from a routine treatment which included drenching, restricted his drenches to 3-ounce doses of a weak solution of spirits of nitrous ether and aromatic spirits of ammonia, which he himself gave with the utmost care and gentleness, and thus did his patient no harm, while materially benefiting the ledger by his frequent attendances. It is only fair to say, however, that he fervently believed in the efficacy of his homœopathy, and, as this occurred twenty years ago, he was perfectly justified, because, failing his innocuous medicinal ministrations, the stud grooms or owners themselves would have prescribed and "drenched" the animals, with evil results.

It is probable that most experienced practitioners who are so indulgent as to read the foregoing remarks will find nothing to learn from them, but it is hoped that the observations may be of some use to young practitioners and students.

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STRICTURE OF THE ILEUM IN THE HORSE.

By J. E. HUTCHINSON, M.R.C.V.S.,
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THE subject was a bay cart gelding seven years of age, about 16–3 hands, doing ordinary farm work. I was called to him during March last about midnight.

I was informed by the owner that the animal had been in pain most of that day and had passed no fæces for several hours.

He was in considerable pain, which varied in degree at intervals. When the pain was excessive he would stand with his nose almost resting. The pulse rate numbered from 85 to 90 per minute; temperature, I believe, was about 102° F.; and respiration somewhat increased; not much tendency to swelling. Examination *per rectum* showed a contracted rectum and a tendency to strain.

The pulse was irregular in action and the artery dilated. Auscultation over the region of the heart revealed a blowing sound in addition to irregularity of action. I was informed that the patient had been dull at work for some weeks and was soon tired.

The owner also informed me that he had given him 1½ pints of linseed and two or three colic drinks.

Seeing that he had decided symptoms of heart disease I gave an unfavourable prognosis.

Treatment consisted of 5 gallons of tepid water in which was dissolved ½ pound of common salt + ½ ounce of formalin, given by nasal tube as recommended by Captain Lang. I had considerable difficulty in passing the tube. It required two men to hold him up in a normal position, and the swallowing reflex seemed to be almost in abeyance. However, by smearing a quantity of treacle well up the tongue I succeeded in getting the patient to swallow the tube. I also gave ½ grain strychnine hypodermically. At 9 a.m. the next morning the animal was in a state of collapse, and on attempting to pass the nasal tube I could get it nowhere except into the trachea. Administered ½ grain strychnine hypodermically. Horse died about noon.

Post-mortem examination made about 7 p.m. Fæces semi-fluid except for two or three feet before the ileum enters the cæcum. Here the fæces were very firm. Just in front of this impaction at the entrance of the cæcum I found a solid growth which almost encircled the ileum. On cutting into it, it appeared to be hard fibrous tissue, and was causing a most decided stricture of the lumen of the ileum. The heart was greatly dilated with very thin walls, and when cut out dropped almost flat-sided.

Lungs somewhat congested.

Nothing particular noticed wrong with the other organs.

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TWO UDDER DISEASES.

By G. MAYALL, M.R.C.V.S.,
Bolton.

THERE are two external diseases of the udder, apart from cowpox, which we sometimes meet with that call for attention. Now and then we come across a cow with small pea-like swellings on the teats which rupture and heal up by scabbing. They may also appear on the adjacent parts of the udder. Cows with fine-skinned udders seem prone to the complaint, and the assumption is that the lumps are caused by pyogenic organisms being rubbed into the skin during milking. There is no aureole round the nodules, and the teats are not hot, swollen and tender. There is no great discharge from the ruptured nodules, but care should be taken that discharge or skin *débris* does not fall into the milk. A lotion of boric acid and glycerine are useful after the nodules burst, as they are also in cases of cracked teats. It may be applied to affected teats by immersing them after milking into a bottle (with a wide mouth) of the lotion and letting it dry on. At the same time, a dose of salts given to the cow helps matters. Eusol, too, is an effective and valuable lotion in this ailment. The pyogenic cocci may be conveyed here from one cow's udder to another if the milker is not careful to use antiseptics after milking an ailing cow.

Another ailment that we have seen in both cows and goats affects the subcutaneous tissues of the udder and is seen when the animals have been put on good feed after freshening. The swellings take longer to mature and soften than in the first mentioned instance, and may be seven or eight days before they burst. They are usually bigger and discharge a considerable quantity of pus, leaving a blackish scab. Bathing the udder with a mild warm antiseptic such as Izal and the application of salicylic ointment in the early stages seems to help. It is doubtful whether this is a " rubbed in " disease, because parts of the udder are affected that are not subject to friction. There may be some contamination from the shippon floor, and some men believe it occurs when musty or mouldy straw is used for bedding. There is a good deal of danger of the milk becoming contaminated here, especially when the swellings rupture, and the necessity of discarding it for a time must be considered.

Taxus baccata

YEW-TREE POISONING.

By E. C. WINTER, F.R.C.V.S.,
Epsom.

I WAS telegraphed for one morning early to come and investigate the cause of the sudden deaths of five in-calf heifers and one three-

year-old bull, supposed to be malicious. Three more heifers were affected and were reeling about the field, as if they were drunk, being only semi-conscious and half blind, fluid fæces passing away involuntarily, and slime flowing from the mouth and nose.

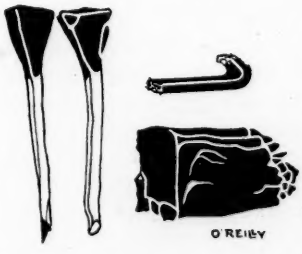
I asked if there were any poisonous plants about, or if any garden refuse had been thrown out, and the answer was in the negative. I walked round the field and found that a large branch had been broken off a yew-tree some time before and that the cattle had been browsing on this. The owner assured me that cattle often eat the green shoots and suffered no harm.

On making post-mortems, the spicules of the yew were found in large quantity in each of the stomachs of the dead animals. The owner was pleased to find that the poisoning was not malicious, although he lost the value of the cattle. This peculiarity of yew poisoning, i.e. " That the ferment set up in the dead spicules is far more poisonous than the live ones are " may not be generally known. The remaining cattle, ten in all, got a brisk dose of physic and stimulants, and there were no further casualties. The offending yew-trees were well fenced in at once.

FOREIGN BODIES SWALLOWED BY A DOG.

By E. L. BUTTERS, M.R.C.V.S.,
Liverpool.

A PIECE of iron weighing 2 ounces and three old horse nails were passed by an Airedale bitch seven months old. She showed no ill-effects whatever, and I would have known nothing about it if one of my men had not noticed these things in her fæces whilst she was having a motion one day. On the following day I myself saw her pass three more old horse nails, but I did not trouble to collect these. It seems strange that there was never any diarrhœa, etc., nor was she ever off her food. She was only staying with me as a boarder, and being very friendly in disposition was allowed to run about as she wished, so I suppose she must have wandered into the forge and picked up these delicate morsels.



TUBERCULOSIS IN A CAT.

By J. H. Mason, M.R.C.V.S.,
Late Professor of Pathology and Bacteriology, the Veterinary College, Glasgow.

Subject.—A male cat, castrated, about two years old.

History.—A swelling had, in about the period of a week, developed in the parotid region of the right side. No indication as to its cause was forthcoming.

Symptoms and Treatment.—The enlargement mentioned was hard, of about the size of a marble, and only slightly painful. From the right eye exuded a thin, hæmorrhagic fluid. As difficulty was experienced in keeping a " bandage dressing " in place, the swelling was daily painted with Tr. iodi., and on the fourth day after the cat's admittance it burst. The discharge which came away was thin, scanty in amount, yellowish-grey in colour, and with no appreciable odour. Treatment consisted in the daily application of an antiseptic lotion. Another enlargement appeared in the left parotid region, to be followed in a day or two by another over the frontal bone, in the median line of the head. All three lesions soon developed into ulcers, edges raised, surface grey, and devoid of healthy granulations. An accompaniment of the third swelling was an enlargement of the peri-ocular tissue, a fluid, resembling pure blood, exuding from the eye.

The cat's appetite was poor, but it always took a little of what was offered. The animal itself was dejected, thin, hide-bound, temperature varying from 102°–103·5° F. It only occasionally took an interest in life, being generally seen huddled close to a radiator.

As the case had now been hanging on for about a month, more drastic treatment was adopted. All three ulcers were curetted, and swabbed with pure formalin. This certainly had the effect of drying them up, but after two days the thin discharge exuded again.

At the suggestion of Dr. Whitehouse, Principal of the Glasgow College, a smear of pus was stained by Ziehl-Neelsen's method. Tubercle bacilli in typical formation and in large numbers were demonstrated. The cat was, of course, destroyed.

A post-mortem showed no macroscopic lesions, other than those described.

A guinea-pig was injected subcutaneously with a few drops of pus. Death occurred in exactly fourteen days.

A post-mortem showed macroscopic lesions in the mesenteric and hepatic lymph glands, liver, spleen, diaphragm, and on the peritoneum, directly over the inoculation point.

Microscopically, tubercle bacilli were demonstrated in the mesenteric and hepatic lymph glands, liver and spleen. None were seen

in the kidney or lung. No sections were made of the diaphragmatic or peritoneal lesions. No indication of necrosis or caseation was seen microscopically.

The moral of this case is fairly obvious. To neglect searching for tubercle bacilli would place the diagnosis of the case in a very shaky position, and the danger to human life can hardly be overestimated.

[In connection with this case it is interesting to read the article by Dr. Stanley Griffith on pp. 337 *et seq.*, and the notes in the VETERINARY JOURNAL, p. 74, February issue, and p. 113, March issue (1923), on tuberculosis in the cat.]

TUBERCULOSIS IN THE GOAT.

By W. L. LITTLE, F.R.C.V.S.,

Reading.

THE subject of this note was a female pedigree goatling, eighteen months old, coming from a heavy milking strain.

Although never having been mated nor her udder being interfered with, she came into milk at twelve months old, and just after this was noticed to be losing condition. This wasting continued, until at eighteen months old she was unable to rise and was destroyed. During the illness and prior to it she was never noticed to have diarrhœa. A slight cough was only noticed a few weeks before being destroyed.

She was bred by the owner and never left his premises, was hand reared, being fed on goat's and occasionally cow's milk, the latter coming from the owner's cows, none of which have ever shown signs of tuberculosis, being in very good condition, but unfortunately have not been tested with tuberculin. Her own sister and mother appear healthy, her grandmother was destroyed when affected with sturdy, her great-grandmother is still alive, milking well and apparently healthy; it is said that she had an enlargement of the udder suggestive of tuberculosis; has always been a heavy milker, her milk being normal; she has been sold and could not be examined.

On post-mortem examination it was found that the carcase showed every sign of wasting, about a pint and a half of clear fluid was present in the abdomen, the spleen showed two white nodules about the size of No. 6 shot, all the mesenteric glands were enlarged, some showing caseating centres, both lungs showed extensive consolidation with caseation, the bronchial and mediastinal glands were all affected, the heart was noticeably thin and flabby. No other lesions were discovered.

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Portions of the diseased viscera were examined by Sir John M'Fadyean, who said: "The lesions have the quite typical appearance of tuberculous lesions in the goat, but in spite of a good deal of searching of smears . . . I have not been able to find any tubercle bacilli . . . the lesions have the characteristic histology of tuberculous lesions."

Guinea-pig inoculations were made by Mr. A. T. R. Mattick, of the National Institute of Research into Dairying, Reading, who very kindly took an interest in the case, with positive results in each instance, being verified by microscopical examination of smears from the affected lymphatic glands.

PATHOLOGICAL MATERIAL URGENTLY WANTED.

Dr. Stanley Griffith, M.D., Field Laboratories, University of Cambridge, asks for fresh specimens of tubercular material from horses, dogs, cats, and birds, especially the equine variety.

Dr. O'Brien, C.B.E., M.D., and Mr. H R. Allen, M.R.C.V.S., of Messrs. Burroughs Wellcome and Co., Research Laboratories, Beckenham, Kent, ask for fresh specimens of blackleg muscle.

The Editor will be glad if any practitioner will send him clinical notes of cases of Purpura Hæmorrhagica treated by Professor Imrie's intravenous formaldehyde solution, the details of which were described by Mr. James McCunn, M.R.C.V.S., in the VETERINARY JOURNAL for June 1923.

NOTICES

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